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list of the earlier earthquakes within the province, beginning with 1784. Seven pages are devoted to a list of data from instruments at foreign stations, and fifteen pages to a discussion (largely mathematical) of the depth of the earthquake centrum.

Seismologists will welcome the elaborate catalogue of Mexican earthquakes which is published in the last number of the series, with its earnest of further work along the same line.

HARRY FIELDING REID. "Seismological Notes," *Proc. Am. Philos. Soc.*, Vol. XLVIII, No. 192, 1909, pp. 303-12.

Under this somewhat unimpressive title Professor Reid has put forward an entirely new theory of the cause of earthquakes. In his own summary this theory is thus stated:

Tectonic earthquakes are caused by the gradual relative displacement of neighboring regions which sets up elastic strains so great that the rock is ruptured: and that at the same time of the rupture no displacements of large areas take place, but there occurs merely an elastic rebound, to an unstrained position, of the lips of the fault extending but a few miles on each side of it.

This theory is visualized for the reader by diagrams representing two short wooden blocks joined by a thick layer of stiff jelly which has been divided by a sharp knife into two equal layers. The blocks being held together under slight pressure, they are given a shearing motion. The jelly is thereby deformed much as would be a rubber layer, and the friction between the jelly surfaces is reduced by a release of the pressure upon the blocks. The two jelly layers now suddenly resume their former unstrained attitudes with the production of a fault of lateral displacement at their plane of junction. This fault is supposed to simulate in its manner of formation the recent displacement along the California rift, and the theory will command attention, particularly, since Professor Reid, as a member of the California State Earthquake Commission, has been intrusted with the problems of mechanics involved in the recent earthquake displacements, and has in preparation the second volume of the report of the commission.

The value of the theory will be adjudged differently by different workers, but it seems safe to say that its assumptions are far too sweeping and that the theory in its present form would never have been devised had the study of any save the California earthquake led to its framing. Of all known earthquakes which have been accompanied by visible displacements in the surface of the ground, this one is unique by reason of the large

proportion of the lateral to the vertical component of movement. As already pointed out by several foreign critics, the report of the commission is decidedly provincial in that it fails to take any account of work already done upon earthquakes, and because all conclusions seem to have been reached as though no other earthquake had been known or studied. Probably the most distinguished geologist of the commission has said of the California quake: "That event was so far unforeseen that no seismologists were at hand and the duty of investigation fell, in the emergency, on a volunteer corps of geologists and astronomers" (*Science*, N. S., Vol. XXIX, January 22, 1909, p. 122). While no doubt accounting for the notably local aspect of the study, this hardly furnishes its excuse. The literature of the subject is large and for the most part easily accessible.

In his discussion in support of the theory advanced, Professor Reid says, "there is a consideration which seems almost decisive in its favor." This consideration is derived from trigonometric surveys made (I) 1851-65, (II) 1874-92, and (III) 1906-7 (after the great quake). These surveys show clearly that lateral displacements measured in feet occurred within the wide zone bounding the great rift and in both the intervals I-II and II-III. This result, it should be stated, is quite in harmony with modern views of earth displacements. What is needed, however, in order to prove Professor Reid's contention, is a determined lack of connection in time between displacements during much shorter intervals and the earthquakes which have been so frequent in the district. The crucial question to be decided is whether a movement of a portion of the earth's outer shell was true warping or was a displacement of individual parts *per saltum* by repeated small amounts. Reid's theory leaves the smaller and frequent *temblors* altogether unaccounted for.

The argument that the amplitudes of the displacements revealed in the trigonometric data are greatest in the vicinity of the rift and fall away rapidly from it, is without force, since we know that faults revealed in geological sections quite generally show distribution of displacement over a number of planes within a zone, and the trigonometric stations are here so widely separated as to furnish no crucial data. There is, however, one consideration quite out of harmony with the Reid theory. Rock slabs which, by slow and continued application of stresses, have been forced into warped surfaces have been found to take on a permanent "set" and do not return by rebound to their original attitudes. As already pointed out, the validity of the theory can be tested observationally through the frequent "location" of monuments in earthquake countries and comparison of the results with an accurate catalogue of local earthquakes.